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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/568,832	02/17/2006	Felix Kollmer	HH 307-KFM	4888

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EXAMINER	
JOHNSTON, PHILLIP A	

ART UNIT	PAPER NUMBER
2881	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/568,832	KOLLMER ET AL.	
	Examiner	Art Unit	
	PHILLIP A. JOHNSTON	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 June 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 February 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to the amendment filed 6-6-2011, wherein claims 1-7 are pending.

Response to Arguments

2. Applicant's arguments filed 6-6-2011 have been fully considered but they are not persuasive.

3. The Applicant argues at page 16 of the remarks that,

There is no prior art which teaches that Bi-clusters are suitable as primary ions in SIMS and there is no indication in the prior art that not only its mass and charge state, but also its chemical properties, make Bi-clusters particularly suited as primary ions in SIMS.

As explained above, the individual references teach away from the present invention so that their combination could not possibly suggest the invention. Indeed, the principal reference (Schulz et al.) is so far afield from the present invention, since it concerns MALDI, that a person skilled in the art would not consider its teaching as being relevant at all to a primary ion source for SIMS.

The examiner disagrees.

The individual references do not teach away from the claimed invention, but rather specifically address the same problem that is being solved with the claimed invention.

For example, the Schultz reference teaches at Col. 5, line 27-67, an apparatus that includes each of the claimed structural limitations, and has two distinct modes of operation, a SIMS mode and a MALDI mode.

The SIMS mode is first described at Col. 6, line 4-31, and is used to show (note and Figure 2), the improved ion yield obtained with increasing Au^+ cluster ion size. The MALDI mode is then described at Col. 7, line 7-45 to show the improvement in mass resolution obtained from cluster ion implantation of a MALDI matrix material.

In the SIMS mode the Schultz apparatus uses a liquid metal ion source and a Wien filter to provide a mass pure primary ion beam for bombarding a sample and detecting secondary ions, resulting in the observation that ion yield increases with increasing size of the clusters. See Col. 5, line 46-67 and Col. 6, line 4-31.

In the MALDI mode the mass pure ion beam is used to implant Au^+ ions in a matrix material, after which the sample having the implanted matrix is irradiated with a laser and the subsequent mass spectrum shows an improved mass resolution is obtained. See Col. 6, line 53-67 and Col. 7, line 7-45.

One of ordinary skill in the art of SIMS would recognize that Schultz uses a liquid metal ion source and a Wien filter to provide a mass pure primary ion beam, and in use would observe that ion yield from bombardment of a sample increases with increasing size of the clusters in the incident primary ion beam, when the Schultz apparatus is operated in the SIMS mode.

Similarly the Liebl reference is directed to an apparatus where a pure ion beam is used to bombard a specimen and spectrometric analysis is performed on the secondary ions sputtered from the specimen in response to the bombardment. See Col. 2, line 12-25 and Col. 3, line 4-25.

Liebl obtains the results shown in Figure 7 below, which are consistent with the general theory that the secondary ion yield increases with increasing atomic mass and increasing energy of the primary bombarding particles. See Col. 6, line 1-46 and Col. 7, line 41-58.

Liebl concluded from Figure 7 that, in order to generate the maximum number of secondary ions, the mass of the primary ion should be as large as possible. Col. 7, line 44-46.

In other words, the prior art Liebl invention teaches a predictable result from bombardment of a sample with primary ions, wherein using primary ions having a large mass, heavy ions, or ions with a high atomic mass number, will produce a greater number of secondary ions in the sample than bombardment with primary ions that have a smaller mass, lighter ions, or ions with a lower atomic mass number.

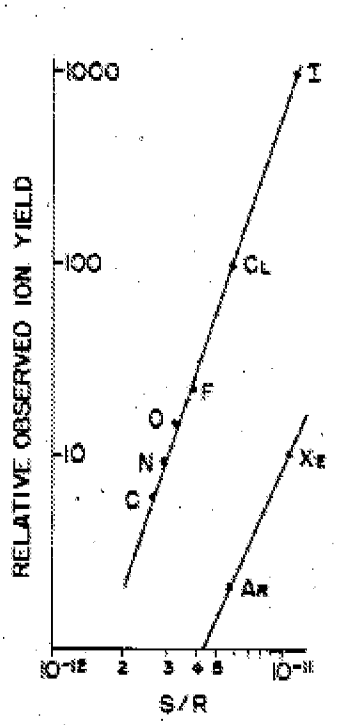

FIG. 7

The Liebl reference would suggest to one of ordinary skill in the art that the production of secondary ions by sputtering is governed by the known physical principle of momentum transfer, wherein bombardment of a sample by heavier ions or atoms predictably increases the sputtering yield relative to the yield obtained with lighter ions/atoms, because the lighter ions would bounce off the sample atoms like a ping pong ball, while the heavier ions would strike the sample with the force of a ball bearing. See for example USPN 4,416,755.

It is important to point out that the prior art teaches the use of heavier ions such as Bismuth for sputtering sample surfaces, which one of ordinary skill recognizes as being equivalent to the use of Bi^+ in SIMS. See; for example, USPN 5,356,870 to Fujiwara and USPN 5,422,304 to Kohiki.

Finally, the Orloff reference provides the liquid metal source of Bismuth ions missing in the combination of Schultz and Liebl, which one of ordinary skill would recognize as an obvious modification to the liquid metal ion source taught in Schultz.

Therefore in light of the above, the examiner concludes that neither Schultz or Liebl teach away from their combination, but rather that both are directed to an apparatus that uses the same known prior art physical process to produce the predictable result of improved secondary ion production yield with large or heavy ions, and that the physical processes used by Schultz, Liebl and Orloff are not only relevant to the applicants apparatus, but are the same physical processes used to produce the predictable results of the claimed invention.

4. The rejection of claims 1-7 are maintained.

5. All claims stand finally rejected.

Claims Rejection – 35 U.S.C. 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,989,528 to Schultz, in view of Liebl, USPN 3,508,045, and in further view of Orloff, USPN 4,426,582.

8. Regarding claims 1 and 6, Schultz teaches at Col. 5, line 46-67, a secondary ion mass spectrometer (SIMS) apparatus that includes;

(a) A liquid metal ion source (37) for irradiating sample (1) with primary ion beam (4) and creating secondary ion particles (note Figure 7; see Col. 8, line 48-67, and Col. 9, line 50-61), where a mixed ion beam is initially emitted by the ion source (37) containing metal cluster ions with various charge states and sizes (cluster statuses); for example, gold ions (Au_5^{n+}). Col. 5, line 46-63,

(b) A spectrometer unit, time of flight mass spectrometer (22) for detecting the generated secondary ions in a SIMS mode. Col. 8, line 48-67, and Col. 9, line 50-61,

(c) The mixed ion beam is filtered with a Wien filter to provide a mass pure primary ion beam (4) that includes only ions having a specific m/z at the target surface. See Col. 5, line 46-67 and Col. 9, line 50-61,

(c) Measuring efficiency of secondary ion emission for cluster sizes ranging from a singly charged single gold ion (Au^+) to multiply charged clusters having n atoms (Au_n^+). Col. 5, line 46-67.

Regarding increasing secondary ion production efficiency, Schultz measures the increased efficiency or yield of secondary ion production resulting from bombarding the sample with gold (Au) ions of increasing size such as ions ranging in size from Au_1^+ to Au_n^+. Col. 6, line 13-67.

Schultz discloses a SIMS apparatus that uses a mass pure primary ion beam for bombarding a sample, which allows two and three dimensional depth profiling of large biomolecules, small molecules such as drugs, small inorganic molecules, and elements in biotissues. Col. 5, line 27-67. Schultz also discloses varying the size of the bombarding gold ions in order to increase the secondary ion generation efficiency or yield. Col. 6, line 13-17.

Schultz fails to disclose bombarding the sample with Bismuth ions to increase the efficiency of secondary ion production from the sample, relative to bombardment of the sample with Au_1^+ gold ions.

Liebl discloses at Col. 7, line 44-46 that, in order to generate the maximum number of secondary ions, the mass of the primary ions should be as large as possible.

Liebl modifies the combination of Schultz and Orloff to provide empirical results that show secondary ion yield is directly proportional to mass of the primary ion and is supported by a theory that secondary ion emission is equivalent to the yield of sputtered particles which increases with the atomic mass of the primary ions and with their energies. Col. 7, line 50-70.

One of ordinary skill recognizes that Bismuth (Bi) has a higher atomic number than Gold (Au) and thus for the same charge and cluster state, Bismuth has a higher atomic mass than

Gold, which as taught in the prior art Lieble reference would produce a higher secondary ion yield than Gold, when Bismuth is used as the primary ion for bombarding a sample surface and producing a highly sensitive indication of the composition of the material.

Therefore it would have been obvious to one of ordinary skill in the art that Schultz would bombard a sample with a Bismuth primary ion beam since Bismuth has a higher mass than Gold and as predicted by Liebl, would increase the efficiency of secondary ion production from the sample, relative to bombardment of the sample with gold ions, thereby providing increased sensitivity for the analysis of the secondary molecular and elemental ions created during bombardment of a sample surface with a SIMS apparatus. See Liebl; Col. 1, line 32-39 and Schultz; Col. 1, line 14-23 and Col. 5, line 27-31.

Regarding the use of a Bismuth coated liquid metal ion source, the combination of Schultz and Lieble, as described above discloses the use of a liquid metal source in a SIMS apparatus that produces a mass pure primary ion beam for bombarding a sample, where use of a Bismuth primary ion beam for bombarding the surface provides increased sensitivity for the analysis of the secondary molecular and elemental ions. Col. 5, line 27-67.

The combination of Schultz and Lieble fails to explicitly teach using a liquid-metal emitter coated with pure metallic Bismuth or of a low-melting-point alloy containing such that a Bismuth ion mixed beam can be emitted by the ion emitter under the influence of an electric field,

Orloff teaches a liquid metal ion source having emitter 11B, which is coated with liquid metal, such as Bismuth, where the liquid metal attains a very intimate, uniform wetting of the material of the emitter. See Col. 4, line 1-14; Col. 6, line 12-31; and Col. 7, line 62-67.

Orloff modifies the combination of Schultz and Lieble to provide a simple drawn tungsten field emitter coated with Bismuth, with a variable emission current over the nanoamp to microamp range shown in Figures 2A, 2B and 3). See Col. 9, line 53-59.

One of ordinary skill would use a liquid metal ion source that emits Bismuth in order to provide Bismuth ions in the primary ion beam for performing depth profiling with a SIMS apparatus.

Therefore, it would have been obvious to one of ordinary skill that the combination of Schultz and Lieble would use the Bismuth coated emitter of Orloff to provide an ion source for producing high current, medium energy Bismuth ions in a SIMS apparatus, thereby performing two and three dimensional depth profiling of. See Orloff; Col. 1, line 12-16 and Schultz; Col. 5, line 32-45.

9. Regarding claim 2, the combination of Schultz, Liebl and Orloff discloses a mass-pure primary ion beam of the Bi_n^{p+} ion type, described above regarding claims 1 and 6.

10. Regarding claim 3, the combination of Schultz, Liebl and Orloff teaches using a time-of flight, secondary ion mass spectrometer, as described above regarding claims 1 and 6.

11. Regarding claim 4, the combination of Schultz, Liebl and Orloff discloses a primary ion beam having the claimed beam current range, described above regarding claims 1 and 6.

12. Regarding claims 5 and 7, the combination of Schultz, Liebl and Orloff discloses the claimed invention except a liquid metal ion source using a Bi-Pb alloy; however, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a Bi-Pb alloy, since it have been held to be within the ordinary skill of worker in the art to select a known material on the basis of its suitability for the intended use. One would have been motivated

to use a Bi-Pb alloy for the purpose of providing a source of Bismuth metal having a lower melting point and vapor pressure than pure Bismuth.

Conclusion

13. The Amendment filed on 6-6-2011 has been considered but is ineffective to overcome the references cited in the Office Action mailed 1-11-2011.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor Robert Kim can be reached at (571) 272-2293. The fax phone number for the organization where the application or proceeding is assigned is 571 273 8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ
August 2, 2011

/PHILLIP A JOHNSTON/

Primary Examiner, Art Unit 2881